Fig. 1

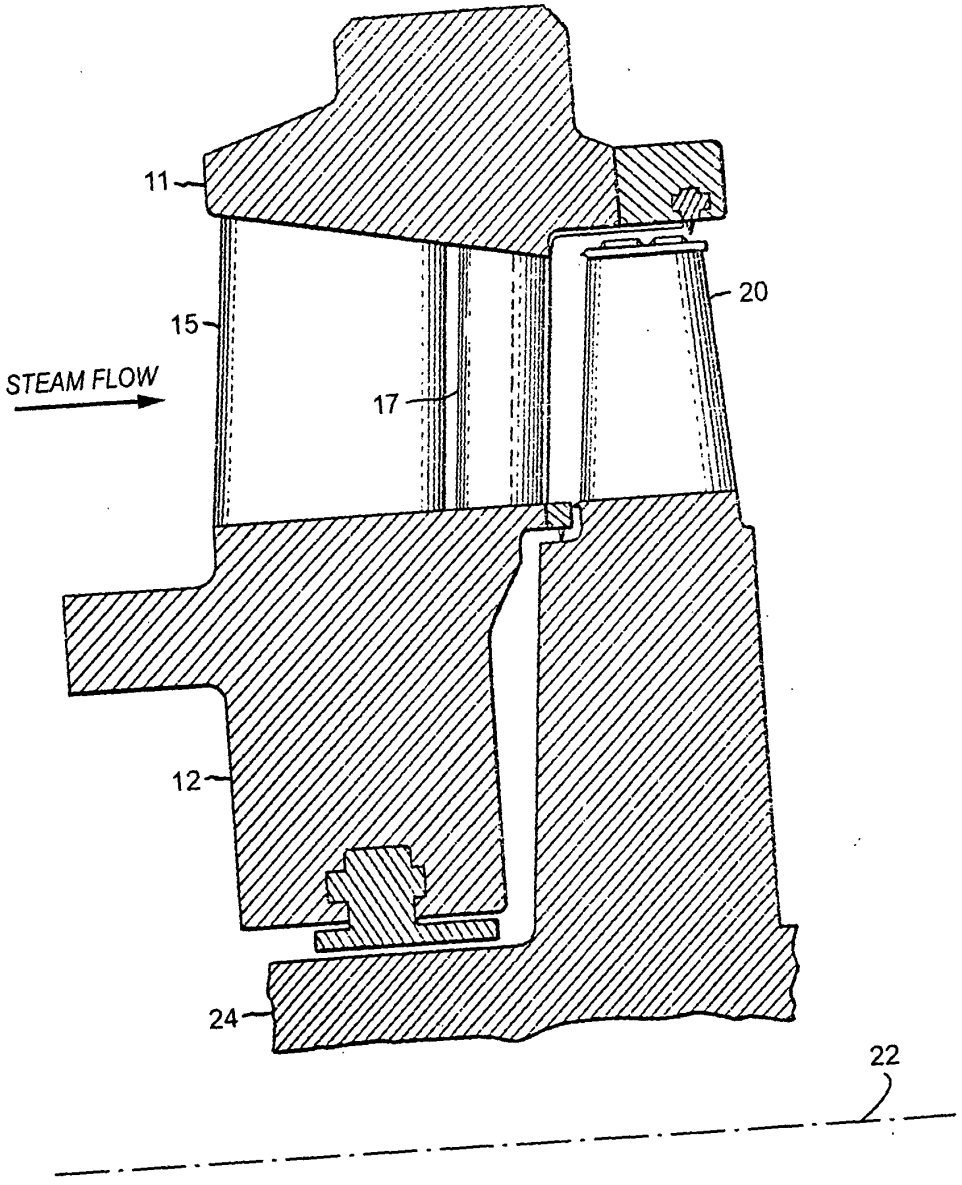


Fig. 2

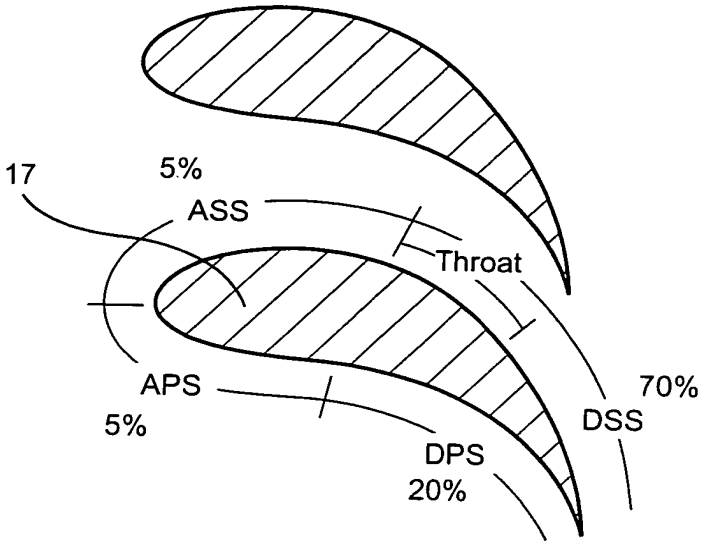
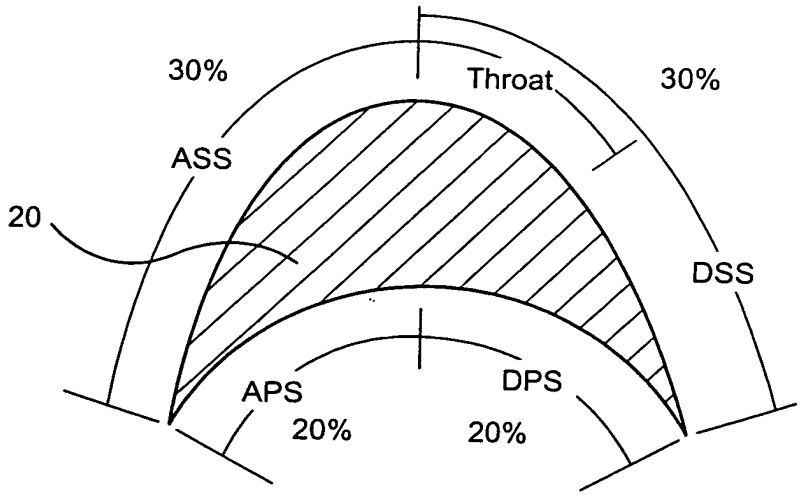

17
5%
ASS
Throat
70%
DSS
APS
5%
DPS
20%

Fig. 3


30%
Throat
30%
ASS
20
DSS
APS
20%
DPS
20%

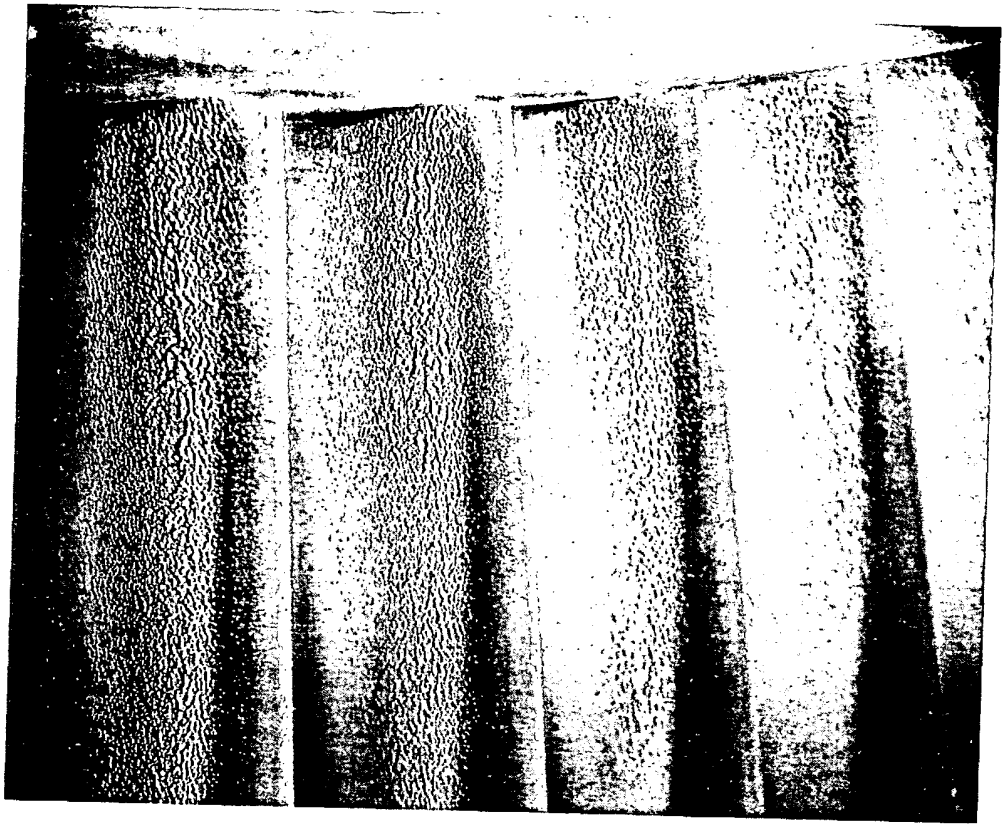


Fig. 4

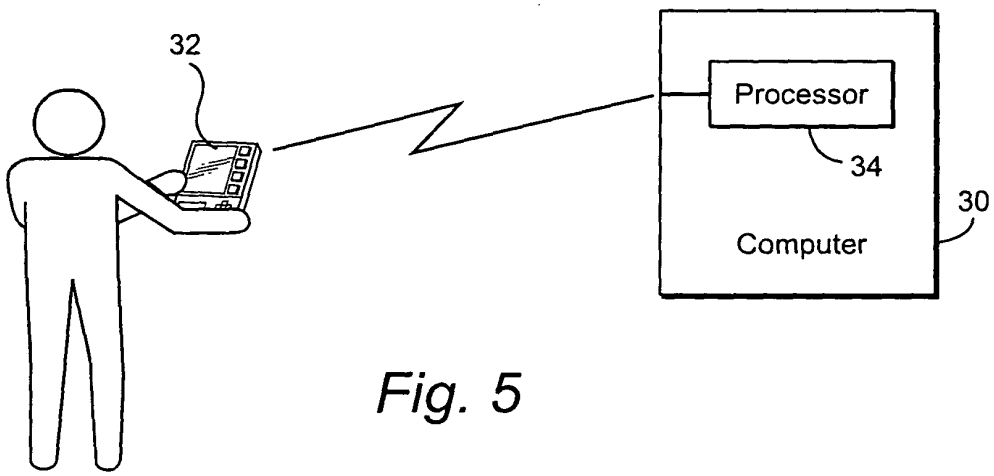

32
Processor
34
30
Computer

Fig. 5

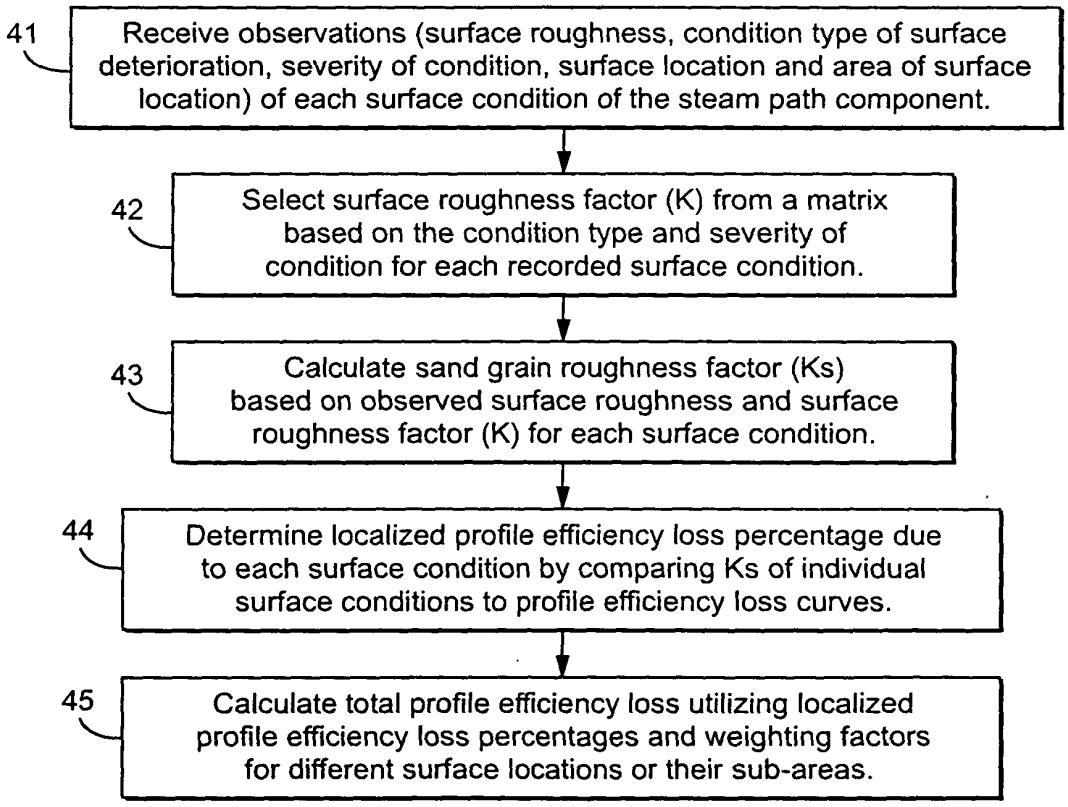

41
Receive observations (surface roughness, condition type of surface deterioration, severity of condition, surface location and area of surface location) of each surface condition of the steam path component.
42
Select surface roughness factor (K) from a matrix based on the condition type and severity of condition for each recorded surface condition.
43
Calculate sand grain roughness factor (Ks) based on observed surface roughness and surface roughness factor (K) for each surface condition.
44
Determine localized profile efficiency loss percentage due to each surface condition by comparing Ks of individual surface conditions to profile efficiency loss curves.
45
Calculate total profile efficiency loss utilizing localized profile efficiency loss percentages and weighting factors for different surface locations or their sub-areas.

Fig. 6

			STAGE #									
			7									
			TOTAL PROFILE LOSS OF NOZZLE	0.52%								
			% of S. F. Loss	Surface Location	% of local area	$R_{a\text{-}rms}$ μ-in	Severity Rank of Surface Condition	Surface Condition Type	k_S Factor from CRB Matrix	k_S/L ($\times 10^{-3}$)	PE Loss %	
		Admission Side Losses Must Equal 10%	5%	ASS_1	50%	68	2	3	0.119	0.014	0.177%	
				ASS_2	50%	65	2	3	0.119	0.014	0.155%	
				ASS_3	0%							
			5%	APS_1	100%	75	2	3	0.119	0.016	0.228%	
				APS_2	0%							
				APS_3	0%							
			0%	OSW_{AS}	0%							
			0%	ISW_{AS}	0%							
Discharge Side Losses Must equal 90%	Discharge Side Suction Surface Must equal 70%	Throat Losses 7-20% DSS	7%	THT_1	50%	100	3	3	0.332	0.059	1.276%	
				THT_2	50%	70	2	3	0.119	0.015	0.192%	
				THT_3	0%							
			0%	OSW_{THT}	0%							
			0%	ISW_{THT}	0%							
		Discharge Side Losses Should Equal 76-90%	63%	DSS_1	50%	91	3	3	0.332	0.054	1.191%	
				DSS_2	50%	58	2	3	0.119	0.012	0.104%	
				DSS_3	0%							
	DPS Must Equal 20%		20%	DPS_1	100%	75	2	3	0.119	0.016	0.228%	
				DPS_2	0%							
				DPS_3	0%							
			0%	OSW_{DS}	0%							
			0%	ISW_{DS}	0%							
		TOTAL	100%							TOTAL	0.524%	
			60	54	55	51	53	52	56	57	58	

Nozzle Data		
REN	3,246,938	
Throat at Pitch	0.552	
Reynold's Number	13,233,929	Influence Factor
Axial Width	2.250	
Base RMS	32	0.100

Fig. 7

Surface Condition Type of Deterioration		Severity Rank of Surface Condition								
		New surface or None of the I.F. defects	Very Light	Light	Moderately Light	Moderate	Moderately Heavy	Heavy	Very Heavy	Severe
		New/None	VL	L	ML	M	MH	H	VH	SVE
		1	2	3	4	5	6	7	8	9
New machining marks with flow (Power-File or Belt Sander)	0	0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
New machining marks X-flow (Swirls or Roloc Sanding Disc)	1	0.1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Coatings (Plasma/HVOF)	2	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Deposits (smooth)	3	0.1	0.119	0.332	0.546	0.76	0.973	1.186	1.4	2
Deposits-Striated linear build-ups. Typ. in latter LP and some IP stages	4	0.1	0.119	0.332	0.546	0.76	0.973	1.186	1.4	2
Deposits-Fences. Typ. in the Latter LP stages.	5	0.1	0.8	1	1.2	1.4	1.65	1.8	2	2.5
Solid Particle Erosion (SPE)	6	0.1	0.119	0.332	0.546	0.76	0.973	1.186	1.4	2
Grit Blast Cleaning (BC)	7	0.1	0.119	0.332	0.546	0.76	0.973	1.186	1.4	2
SPI-Small Particle Impingement	8	0.1	0.8	1	1.2	1.4	1.65	1.8	2	2.5
FOD-Foreign Object Damage	9	0.1	0.8	1	1.2	1.4	1.65	1.8	2	2.5
Water Erosion	10	0.1	0.119	0.332	0.546	0.76	0.973	1.186	1.4	2
Corrosion Pitting	11	0.1	0.119	0.332	0.546	0.76	0.973	1.186	1.4	2

FORMULAS

Nozzles: $SF_{TOTAL\ LOSS\ Nozz}$ = 10%(ASS+APS)+20%(DPS)+70%(THT +DSS)

Buckets: $SF_{TOTAL\ LOSS\ Bkt}$ = 100%(.30*ASS+.20*APS+.30*DPS+.1*THT+.20*DSS)

Fig. 8

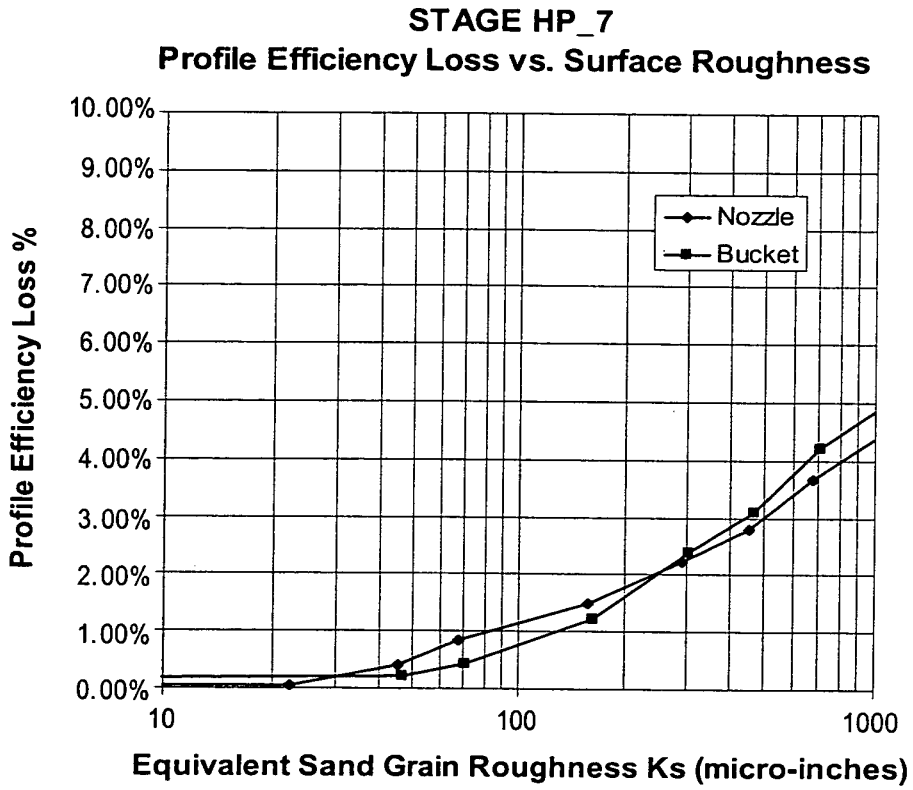

STAGE HP_7
Profile Efficiency Loss vs. Surface Roughness
Profile Efficiency Loss %
10.00%
9.00%
8.00%
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
Nozzle
Bucket
10
100
1000
Equivalent Sand Grain Roughness Ks (micro-inches)

Fig. 9